MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2017/2018

PSM0325 – INTRODUCTION TO PROBABILITY AND STATISTICS

(Foundation in Information Technology / Life Sciences)

4 JUNE 2018
2.30 p.m – 4.30 p.m
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of **THREE** pages excluding the cover page and the Appendix.

2. Answer **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided. All necessary working steps **MUST** be shown.

4. **Statistical table** is provided.

Instruction: Answer all **FIVE** questions.

Question 1 (10 marks)

a. The time taken from a sample consists of 70 students to walk from the hostel to their classes are shown in the table below:

Time (minute)	Number of Students
2 - 4	5
5 – 7	9
8 – 10	19
11 – 13	21
14 – 16	12
17 – 19	4

i. Construct a table with the given guideline: (4 marks)

Time	*m*	*f*	*mf*	m^2f

ii. Calculate the mean and standard deviation. (4 marks)

b. The following data represent the electricity utility bill paid by the first 14 customers for the month of May 2018. (2 marks)

157	133	x	215	208	139	152
167	202	197	124	239	191	169

Find the value of x if the median of the data is 179 and $169 < x < 191$.

Question 2 (10 marks)

a. The probability density function of a continuous random variable X is defined as:

$$f(x) = \begin{cases} \frac{x^2}{8}, & -c < x < c \\ 0, & elsewhere \end{cases}$$ where c is a constant.

i. Find the value of c. (3 marks)

ii. Find $P(-3 < X < 2)$. (2 marks)

Continued...

b. A game is conducted by tossing a biased coin three times. The coin has a probability $P(T)=\frac{1}{3}$ and $P(H)=\frac{2}{3}$, where the event in obtaining head is H and the event in obtaining tail is T.

i. Draw the tree diagram and list the outcome. (3 marks)

ii. Find the probablity of getting at most one head. (2 marks)

Question 3 (10 marks)

a. Three out of five students ask for ice tea with their lunch. A random sample of 15 students are selected. Find the probability that:

i. exactly 6 students ask for ice tea with their lunch. (2 marks)

ii. at least 12 students did not ask for ice tea. (3 marks)

b. In a photographic process, the developing time of prints may be looked upon as a random variable having the normal distribution with a mean of 15.72 seconds and a standard deviation of 0.11 second. Find the probability that it will take:

i. less than 15.60 seconds to develop one of the prints. (2 marks)

ii. any where from 15.50 to 15.90 seconds to develop one of the prints. (3 marks)

Question 4 (10 marks)

a. The results of all the 6 participants in a preliminary test are given:

36 47 36 21 28 40

List all the possible samples of size four from this data and construct a sampling distribution of the sample mean. (6 marks)

b. A publishing company wants to sell a new college textbook. The research department took a sample of 36 similar text books in the market and found that the mean price of RM54.40 for this sample. It is known that the standard deviation is RM4.50. Construct a 90% confidence for the mean price of all such college textbooks. (4 marks)

Continued...

Question 5 (10 marks)

a. Write the null and alternative hypothesis for the following and determine if it is a two-tailed, a left-tailed or a right-tailed test.

i. To test if the mean GPA of all students at a university is lower than 2.9. (2 marks)

ii. To test if the mean amount of time spent per week watching sports on television by all adult males is different from 9.5 hours. (2 marks)

b. A study conducted few years ago claims that adult males spend an average of 11 hours a week watching sports on television. A recent sample of 100 adult males showed that the mean time they spend per week watching sports on television is 9.5 hours with a standard deviation of 2.2 hours. Set up the hypothesis, H_0 and H_1, and test at the 1% significance level if currently all adult males spend less than 11 hours watching sports on television. What is the conclusion? (6 marks)

End of Paper

APPENDIX

Formulae:

1.

	Ungrouped data	Grouped data
Mean:	$\bar{x}=\frac{\sum x}{n}$ $\mu=\frac{\sum x}{N}$	$\bar{x}=\frac{\sum mf}{n}$ $\mu=\frac{\sum mf}{N}$
Variance:	$s^2=\frac{\sum x^2-\frac{\left(\sum x\right)^2}{n}}{n-1}$ $\sigma^2=\frac{\sum x^2-\frac{\left(\sum x\right)^2}{N}}{N}$	$s^2=\frac{\sum m^2 f-\frac{\left(\sum mf\right)^2}{n}}{n-1}$ $\sigma^2=\frac{\sum m^2 f-\frac{\left(\sum mf\right)^2}{N}}{N}$
Median:		$L+\left[\frac{\left[\frac{\sum f+1}{2}\right]-F_L}{f_m}\right]w$
Mode:		$L+\left[\frac{f_m-f_B}{(f_m-f_B)+(f_m-f_A)}\right]w$

2.

	Mean	Variance
Discrete Random Variable X	$\mu=E(X)$ $=\sum xP(x)$	$Var(X)=E(X^2)-[E(X)]^2$ **where** $E(X^2)=\sum x^2P(x)$
Continuous Random Variable X	$\mu=E(X)$ $=\int_{-\infty}^{\infty} xf(x)dx$	$Var(X)=E(X^2)-[E(X)]^2$ **where** $E(X^2)=\int_{-\infty}^{\infty} x^2f(x)dx$

3.

	Formula	Mean	Standard Deviation
Binomial Probability	$P(x)=\binom{n}{x}p^xq^{n-x}$	$\mu=np$	$\sigma=\sqrt{npq}$
Poisson Probability	$P(x)=\frac{e^{-\lambda}\lambda^x}{x!}$	$\mu=\lambda$	$\sigma=\sqrt{\lambda}$

4. The z value for a value of x: $z = \dfrac{x - \mu}{\sigma}$

5. The z value for a value of $\bar{x}$: $z = \dfrac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}}$

where $\mu_{\bar{x}} = \mu$ and $\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}}$

6. Sampling error = $\bar{x} - \mu$
Non-sampling error = incorrect $\bar{x}$ − correct $\bar{x}$

7. Point estimate of μ = $\bar{x}$

Margin of error = $\pm 1.96\sigma_{\bar{x}} = \pm 1.96\dfrac{\sigma}{\sqrt{n}}$ or $= \pm 1.96 s_{\bar{x}} = \pm 1.96\dfrac{s}{\sqrt{n}}$

8. The $(1-\alpha)100\%$ confidence interval for μ is

$\bar{x} \pm z\sigma_{\bar{x}}$ is known

$\bar{x} \pm z s_{\bar{x}}$ if σ is not known

where $\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}}$ & $s_{\bar{x}} = \dfrac{s}{\sqrt{n}}$